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Pasadena, California

AIRS TOTAL PRECIPITABLE WATER OVER THE ARCTIC AND ANTARCTIC DURING SUMMER

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AIRS Science Team Meeting, Greenbelt, MD

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OUTLINES

I. Antarctic Total Precipitable Water (PWV) (Dec 10, 2003-Jan 26, 2004)

- AIRS Level II versus Radiosondes at Dome C
- AIRS Level III and ECMWF versus Radiosondes at two nearest grids to Dome C
- AIRS Level III versus ECMWF over all of Antarctica

II. Arctic PWV (Sept 1-30, 2004)

- AIRS Level III versus ECMWF Analysis over Arctic Land, Greenland, Arctic Open Water, and Sea Ice
- AIRS Level III versus AMSR-E over Arctic Open Water

AIRS data are version IV

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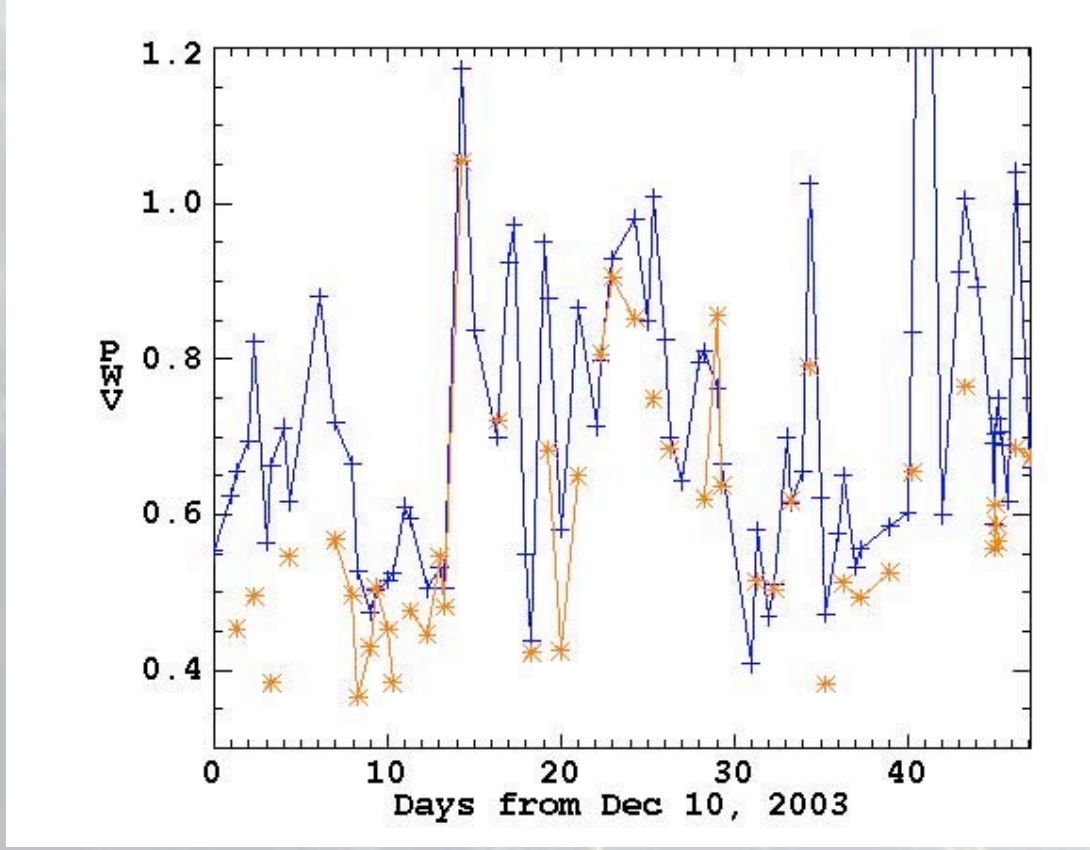
PWV of Radiosondes (78-blue) and Matching AIRS Footprints (Level II; 45-orange; within 100km and 30 minutes of sondes)



The difference between AIRS and Sondes is -0.1084mm (15.5%); absolute difference is 0.1154mm. Correlation coefficient is 0.8295.

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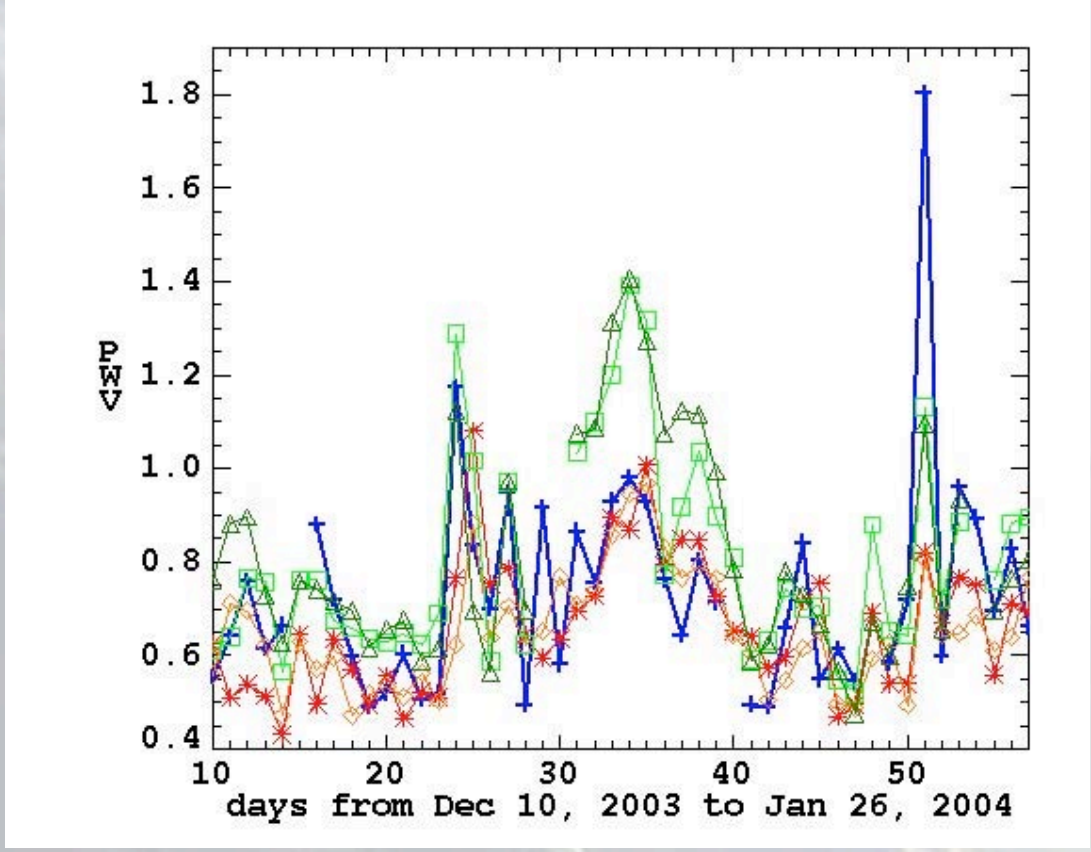
Radiosondes (blue; 75°06S, 123°20E) and AIRS Level III (red) and ECMWF (green)'s two grids (75.5°S, 123.5°E and 74.5°S, 123.5°E)



AIRS has lower values during earlier and later days, and ECMWF has higher values during most days.

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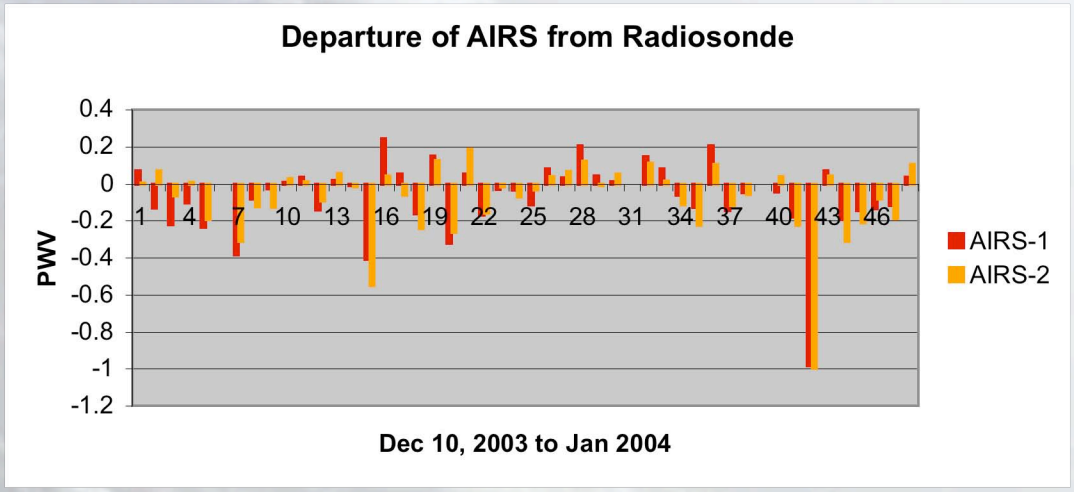
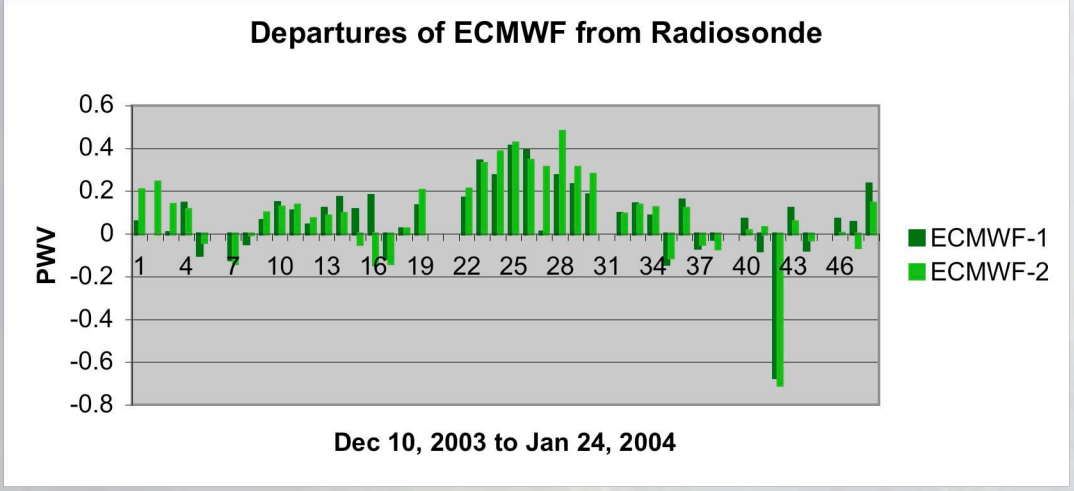
Departure from Radiosondes at the nearest two grids





AIRS: -0.05109mm (-7.06%) and -0.075763mm (-11.09%); ECMWF: 0.0785361mm (11.68%) and 0.110538mm (16.44%)

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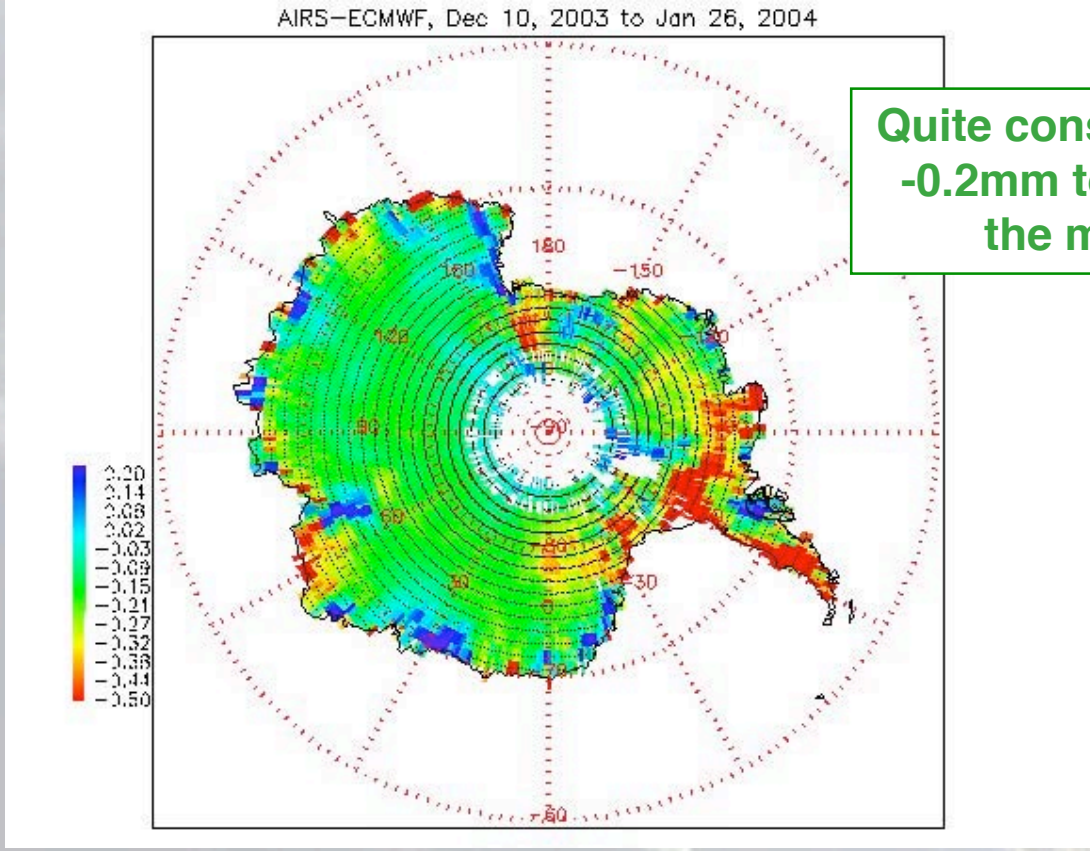
Daily Mean AIRS-ECMWF



Quite constant values ranging from -0.2mm to -0.1mm are found over the majority of Antarctica

Data ranges from -1.5mm to 0.6 mm. In this figure, it is scaled to -0.5 to 0.2mm

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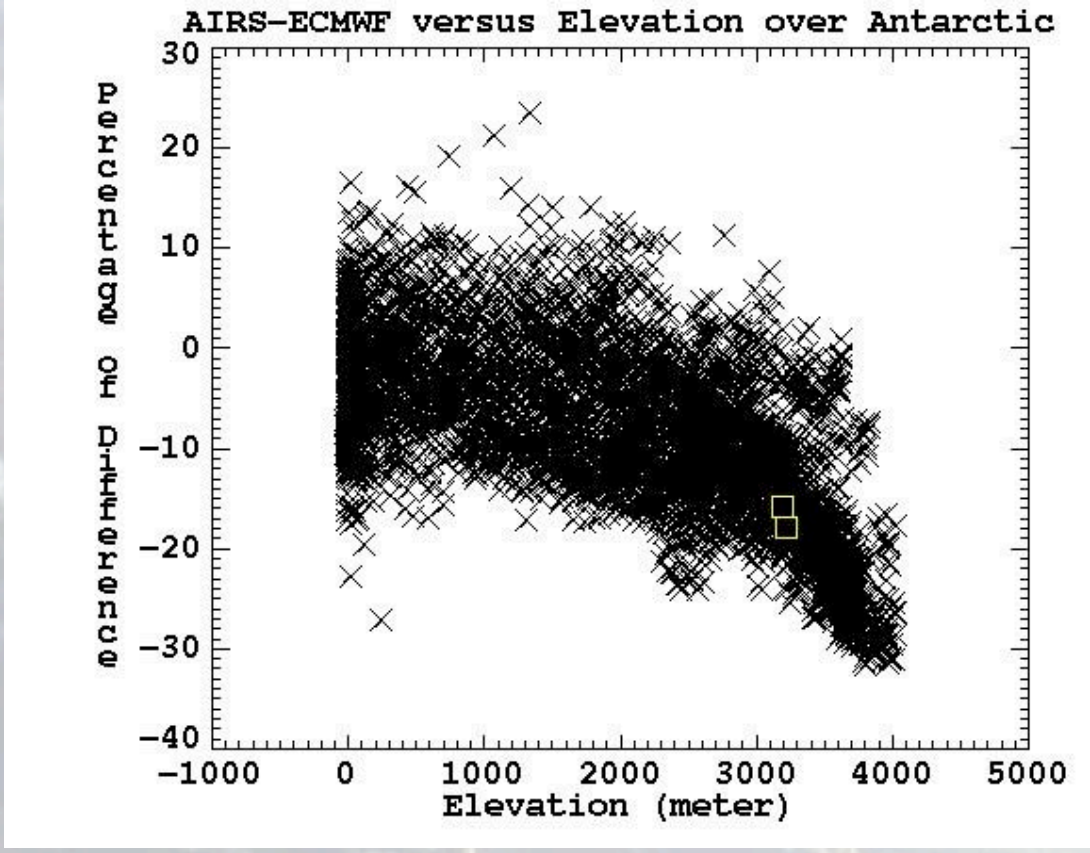
Mean Percentage of Differences Increases with Elevation



Due to constant differences, the percentage of differences increases as PWV decreases. The difference is large at elevation higher than about 2500m

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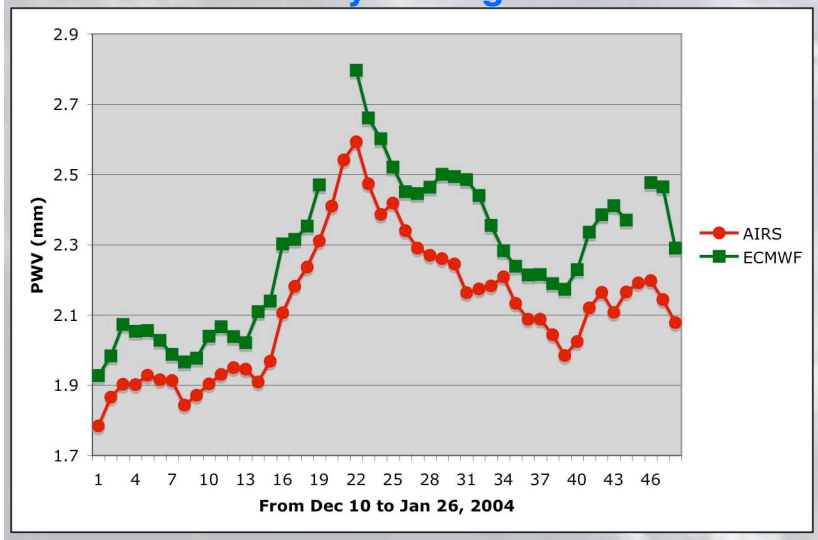
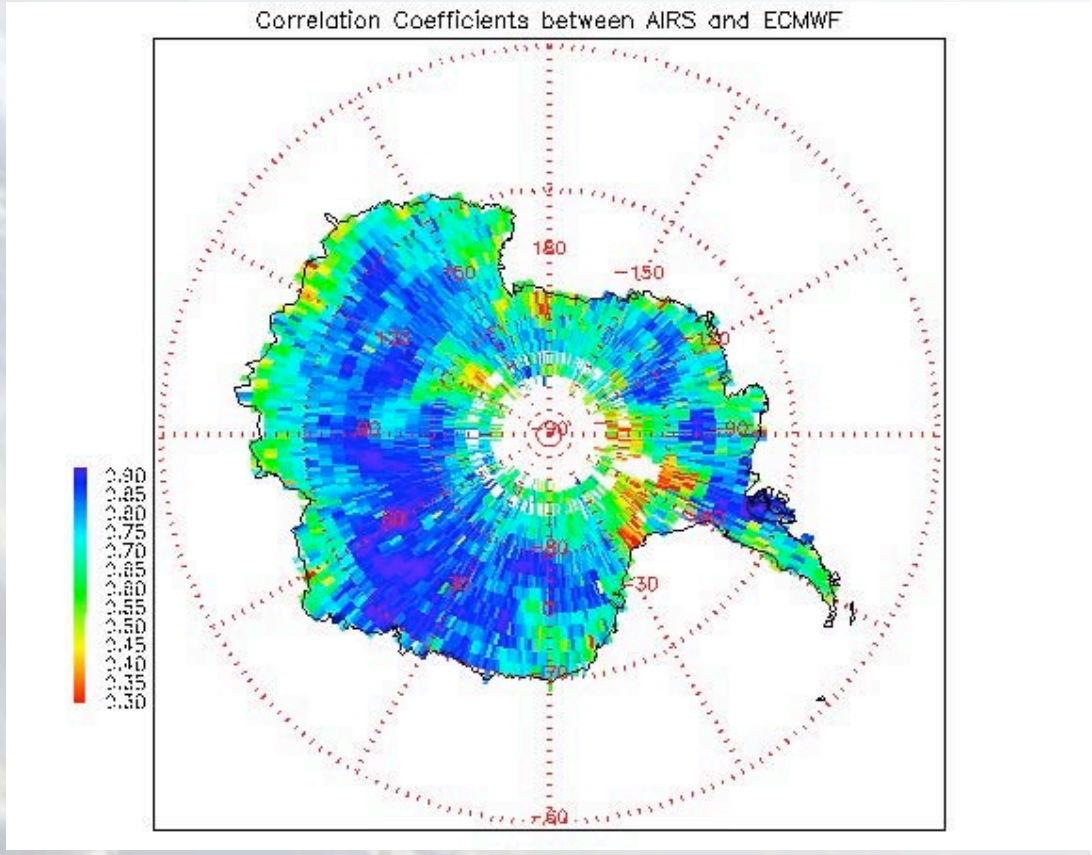
AIRS and ECMWF are highly correlated spatially and temporally

Time Series of Daily Average over Antarctica



Average difference is -0.15345 (6.74%)



Correlation coefficients range from 0.0 to 0.95
This figure is scaled 0.3 to 0.9

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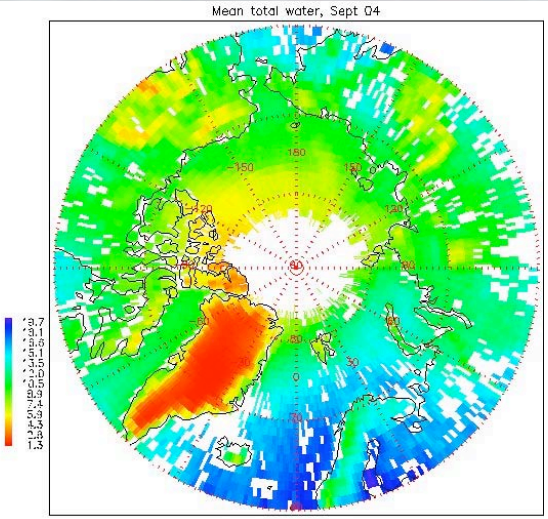
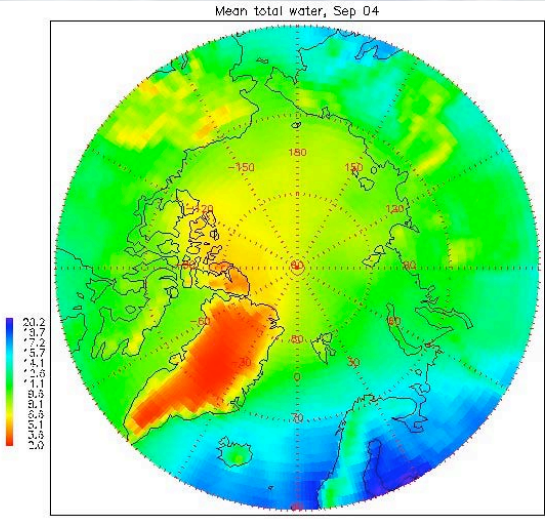
Arctic PWV (north of 60°N), September 2004

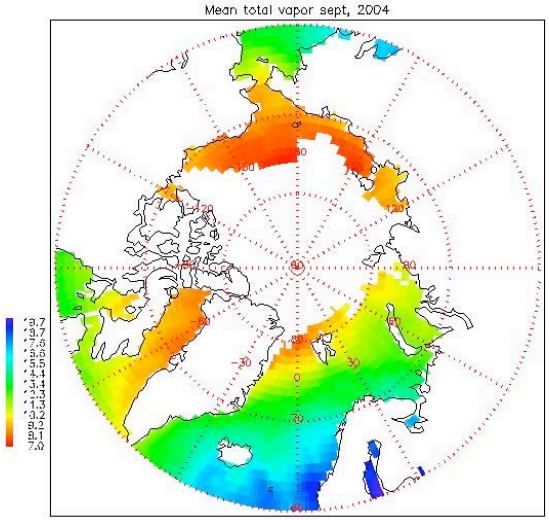
a. AIRS



b. ECMWF



c. AMSR-E



Mean total PWV in Sept 2004

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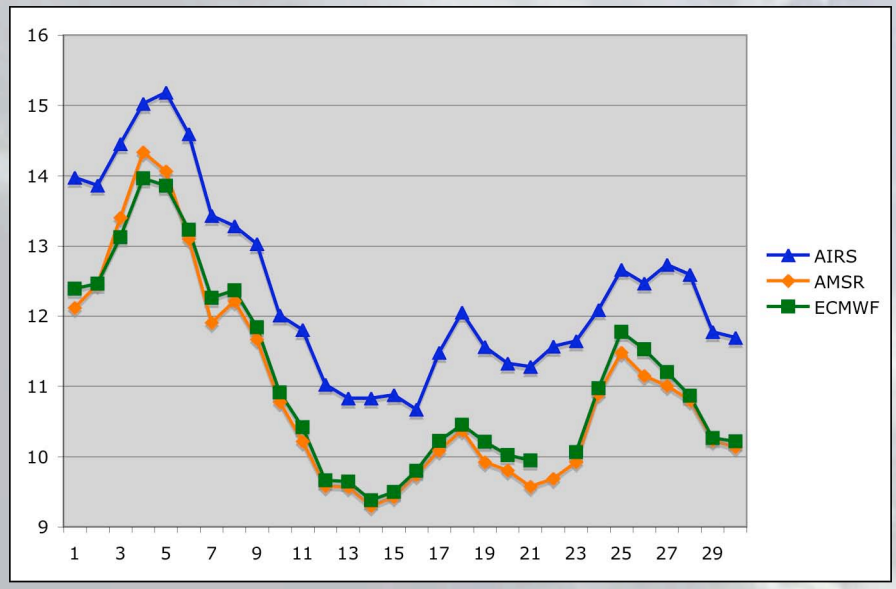
Daily Mean PWV of AIRS (blue), AMSR-E (orange), and ECMWF (green)

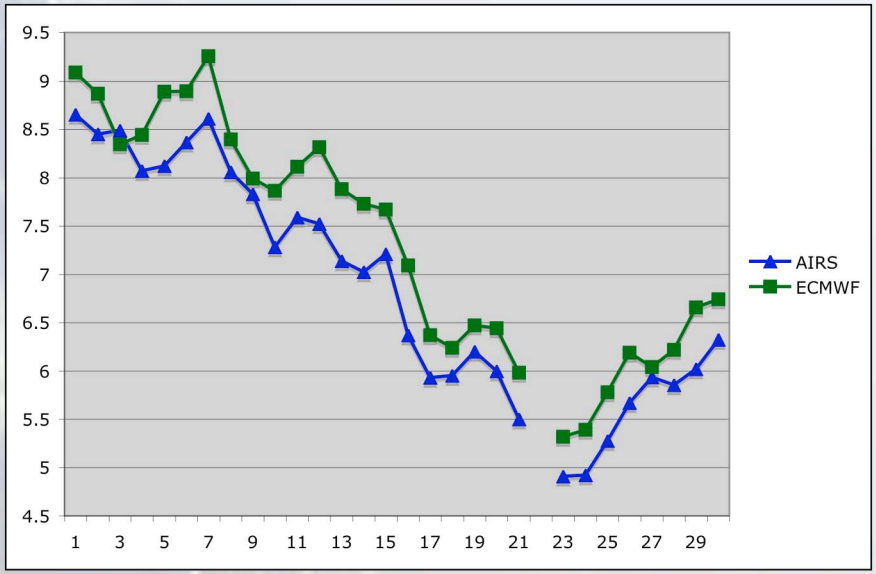
Arctic Ocean Open Water



Average difference between AIRS and AMSR-E is -1.43mm (13.05%)

Average difference between AIRS and ECMWF is -1.27 mm (11.44%)

Arctic Sea Ice



Average difference is 0.46mm (6.29%)

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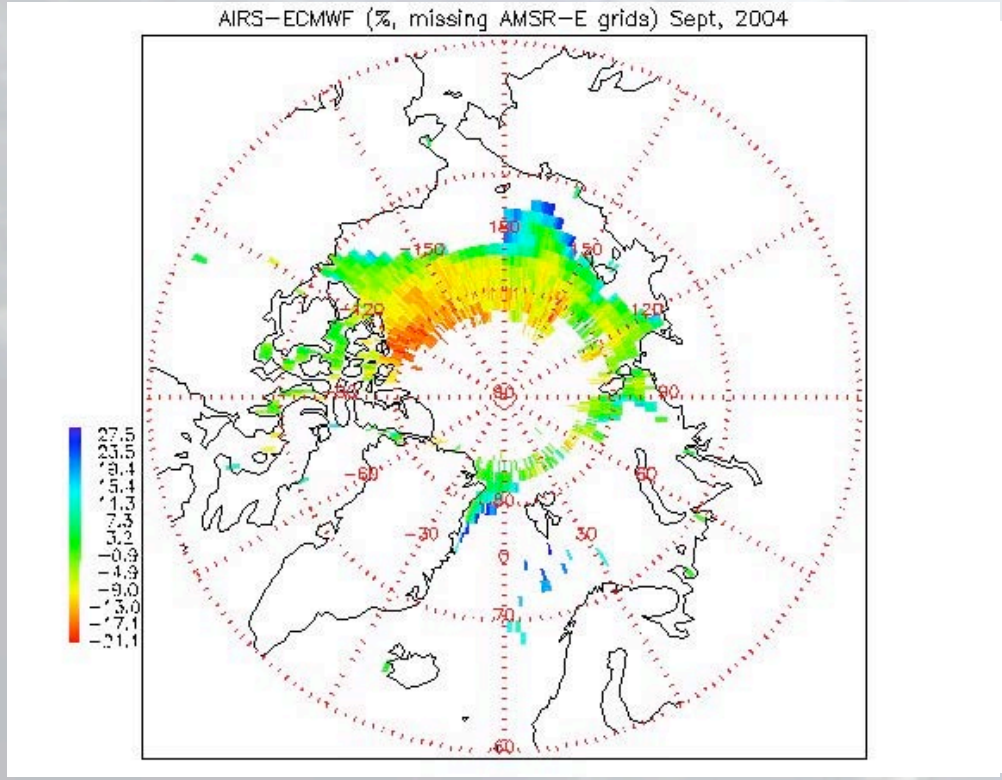
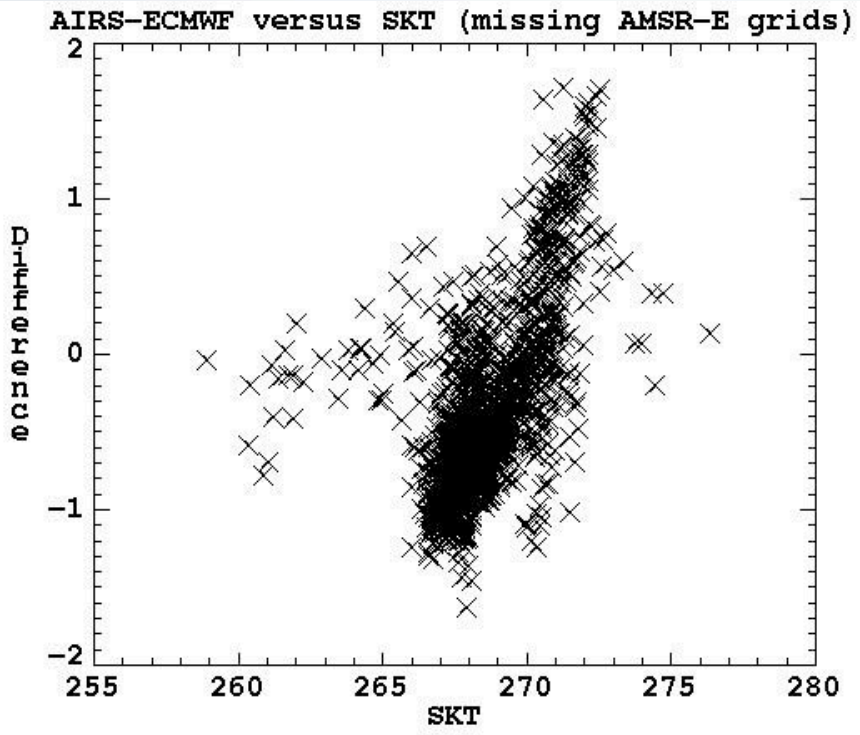
Closer Look at Sea Ice





Changes from negative to positive values may possibly be related to differences between sea ice and broken sea ice?

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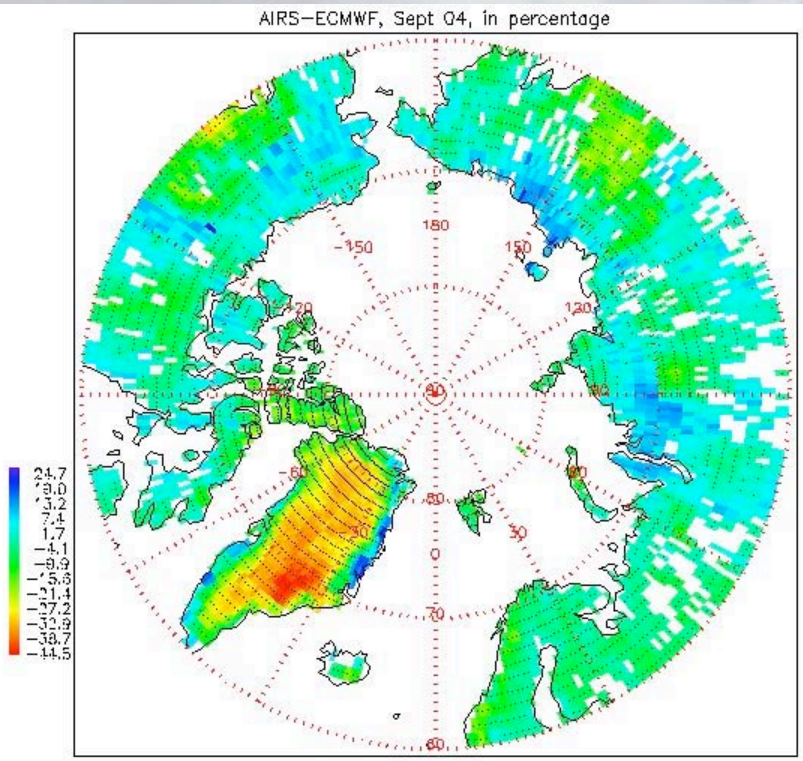
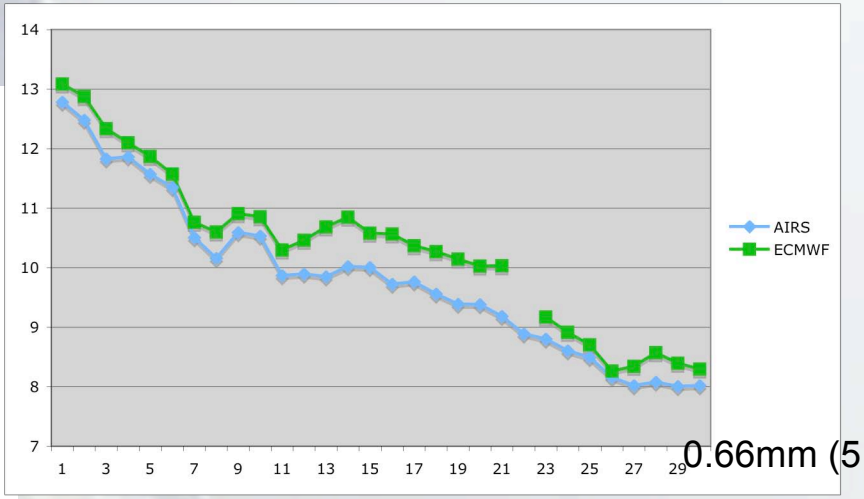
Arctic Land

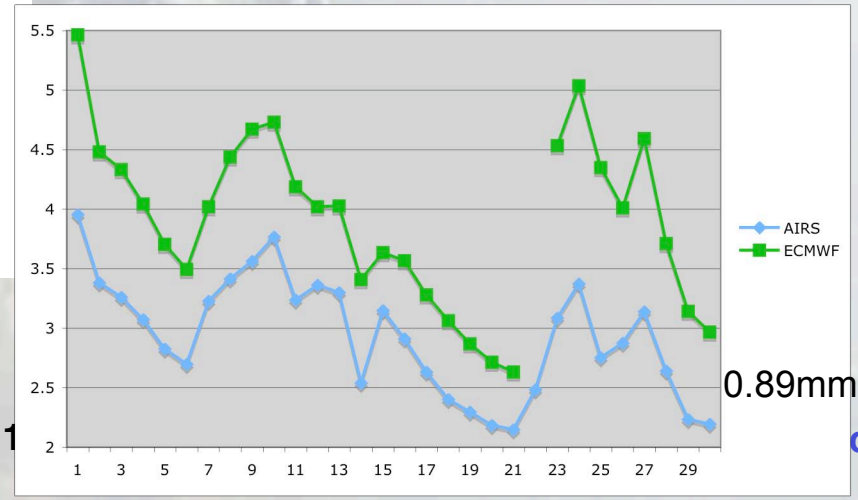


a. Land surface grids excluding Greenland



0.66mm (5.86%)

b. Greenland grids



0.89mm (20%)

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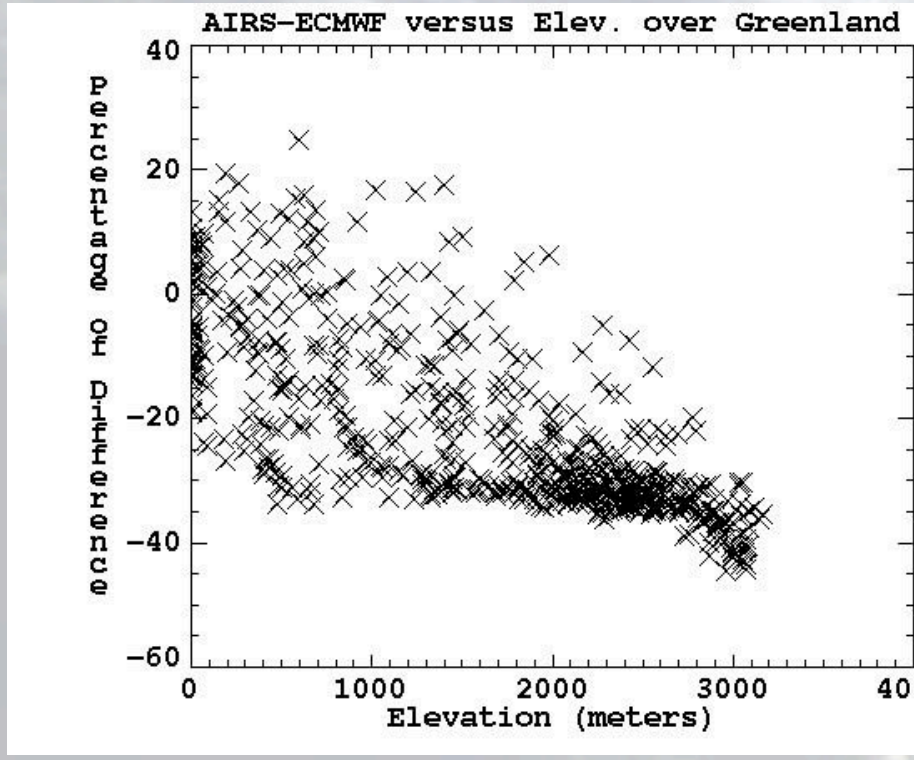
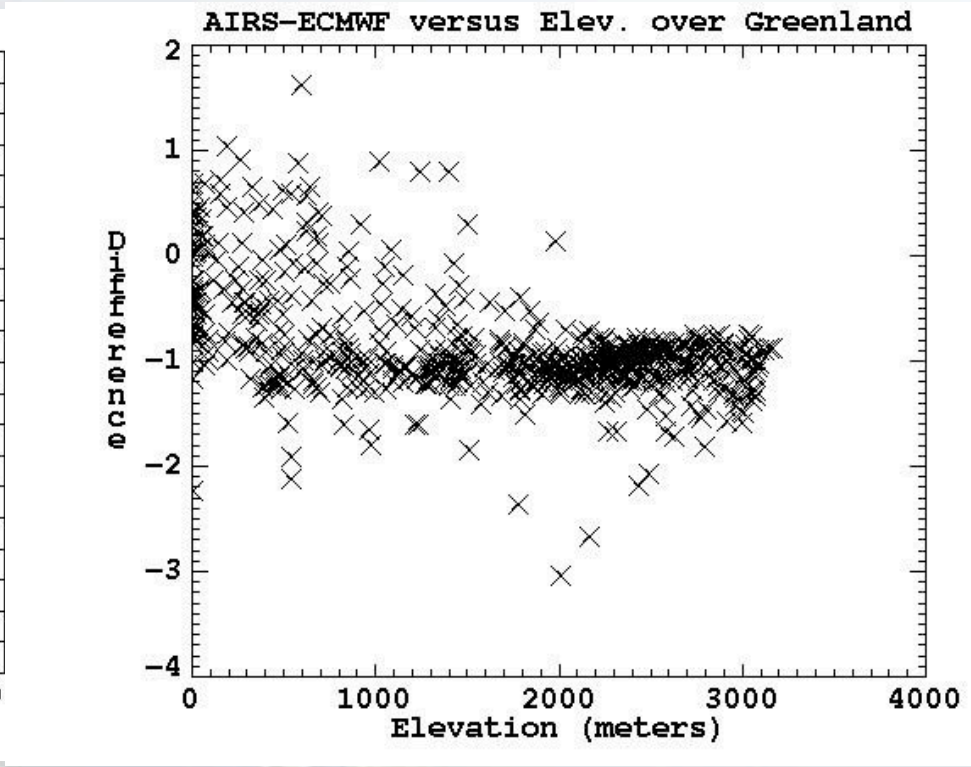
Close up on Greenland





Large percentage of differences are found over high elevations

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Conclusion and Summary

- **AIRS PWV captures variability (both temporal and spatial) well**
- **There are constant differences between AIRS and others**
- **The differences are specific to geographical and surface features**

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Conclusion and Summary (continued)

- **Over High-Elevation Glacier Surfaces:**

AIRS is about 9-15% drier while ECMWF is about 14% wetter than radiosondes. The difference between AIRS and ECMWF is quite constant (around 0.14mm) and independent of the total PWV or elevation over Antarctica

AIRS is about 0.89mm (20.4%) drier than ECMWF over Greenland

- **Over Arctic Land:**

AIRS is 0.66mm (5.86%) drier than ECMWF

- **Over Arctic Ocean Water Surface:**

AIRS is 1.43mm (13.05%) wetter than AMSR-E and 1.27mm (11.44%) wetter than ECMWF

- **Over Arctic Ocean Sea Ice:**

AIRS is 0.46mm (6.29%) drier than ECMWF (may depend on the sea ice conditions)

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Future Work

- Examine other months and seasons?
- Find more radiosondes for comparison over other locations?
- Separate lower troposphere with upper troposphere?
- Explore other variables over high-latitude regions?
- Using AIRS version 5 data?

- Two Manuscripts currently in preparation.

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